

The Effects of Salt on a Tomato

Megan Makowecki

Dr. Ros Coard

Ancient Live in Death (HPAH5080)

History and Archaeology

28/03/2026

Abstract

This experiment tested the effects that different types of salt would have on a tomato slice. Since the Egyptians had used salt as a method of mummification, it is important to test which salts would have been best for the desired results. The experiment used four slices: one control slice that did not have any salt and three experimental slices. One slice was covered table salt, one was covered in epsom salt, and the third was covered in bicarbonate of soda. The slice covered in table salt had the highest level of dehydration. In comparison, the other two slices had grown mold covering most of the slice and showed faster rates of decomposition. The results have a great impact on understanding how different salt compounds effect tomatoes or other living organisms.

Key words: Mummification, dehydration, salt, mold.

Introduction

The methods that the ancient Egyptians used to mummify the remains of those who had passed was a mystery to modern Egyptologists and archaeologists for centuries. Through scientific research the answer was able to be found. The Egyptians were found to have used salt as a method to dehydrate the bodies in order to preserve them. Although humans and fruits are not the same, this laboratory introduces the effects that different salt compounds have on fruits and the process of dehydration.

Methods

This experiment was performed in a classroom as opposed to the standard laboratory. For this experiment a tomato was quartered and separated into four different ziplock bags. One tomato was chosen as the control subject while three different salts were chosen as the experimental subjects. They were weighed and measured by length, width, and breadth. Salt was then poured into the three experimental bags and sealed. Experiment A was filled with 100g of table salt, experiment B was filled with 150g of epsom salt, and experiment C was filled with 150g of bicarbonate of soda. For three weeks the tomatoes were left in the salt and only taken out once a week to be remeasured and reweighed. The change of colour, development of mold, and loss of moisture were also documented each week.

Results

Week one

The tomato as a whole had weighed 96.5g. The control slice weighed 29.15g and measured 52.01mm in length, 40.94mm in width, and 32.96mm in breadth making this slice the biggest four slices to be able to see the effects of not adding any salt. Experiment A weighed 23.36g and measured 52.01mm in length, 38.07mm in width, and 28.88mm in breadth. Experiment B weighed 23.71g and measured 52.46mm in length, 41.33mm in width, and 27.45mm in breadth. Experiment C weighed 23g and measured 50.55mm in length, 37.47mm in width, and 24.20mm in breadth which had made this the smallest tomato size compared to the others.

The skin of the tomato was bright red with spots of a more orange-red colour. The inside had multiple seeds in each slice and had white spots in the middle (see fig. 1). The biggest piece was chosen as the control slice since it would produce the expected results.

The piece that had the most seeds was chosen as experiment A since the table salt was expected to produce the most desirable results. The one with the least amount of seeds was chosen as experiment C since the bicarbonate of soda was expected the most undesirable results.

Week two

Week two the control slice had weighed 26.4g and measured 54.16mm in length, 40.83mm in width, and 29.33mm in breadth. Experiment A weighed 9.5g and measured 42.59mm in length, 24.35mm in width, and 24.26mm in breadth. Experiment B weighed 12.7g and measured 42.53mm in length, 30.26mm in width, and 22.90mm in breadth. Experiment C weighed 10.6g and measured 50.53mm in length, 31.39mm in width, and 21.22mm in breadth.

The control tomato had started to grow a small bit of white mold in the place where the seeds had been. It had also begun to smell of vinegar. Experiment A had begun to show wrinkles on the skin of the tomato and the inside with the juices had dried up the most of the slices. The colour also remained the same compared to week one. Experiment B had kept most of its colour, but had begun to dull around the edges. The juices from the slice had remained and a lot of mold had begun to grow. Experiment C had dulled in colour the most and had mold spots appearing. The salt had absorbed most of the moisture and the tomato had a moldy smell to it and the skin on the back of the tomato had begun to wrinkle a lot (see fig. 2).



Fig. 1 The tomato slices in quarters. In order of experiment C, control, experiment A, experiment B

Week three

In week three the control slice weighed 21.9g and measured 55.21mm in length, 35.57mm in width, 26.74mm in breadth. Experiment A weighed 10.03g and measured 43.20mm in length, 22.13mm in width, and 22.57mm in breadth. Experiment B weighed 9.17g and measured 45.26mm in length, 26.04mm in width, and 18.32mm in breadth. Experiment C weighed 10.5g and measured 40.81mm in length, 33.37mm in width, and 26.47mm in breadth.



Fig. 3 Experiment a week 3

The control slice had collapsed on itself where the juices had been and the mold spot was no longer visible. The smell of vinegar had also become stronger than the previous week and the bag was full of juice from the tomato. Experiment A was wrinkly and most of the moisture had been absorbed, it also had no mold growth anywhere on the tomato (see fig. 3). It also smelled of ketchup. Experiment B had developed a lot of white and greenish black mold where the juices and seeds used to be (see fig. 4). The skin was also very wrinkled and more bent than previous weeks. Experiment C had developed a lot of black mold in place of the seeds and juices. The salt was very hard to remove



Fig. 2 Skin of experiment C



Fig. 4 Experiment B

without removing the mold as well. The skin was very wrinkly and it as well had begun to bend inwards. It had a very moldy smell to it.

Discussion

The tomato slice for experiment A had the expected results of having the most dehydration. Unexpectedly both experiment B and C had developed mold over the entire slice where the expected result was of experiment B showing more signs of dehydration. From week 1 to 2 all the slices had went down in weight significantly except for the control slice which only had a moderate decrease in weight. From week 2 to week 3 experiment A had gained weight from the previous week while the others had kept losing weight. The control slice and experiment B had lost the most weight compared to the others from week 2 to week 3 and experiment C had lost only 0.1g.

Once the slices had lost most of their moisture they showed less progression in the dehydration process. Since experiment A had lost most of its moisture during the first week, it appeared to begin to regain or absorb some of the moisture left in the salt. At the end of the process the control slice had kept most of its original mass compared to week 1 since it had only lost 24.9% of its body mass while experiment B had the most amount of loss at the end of week 3, losing 61.3% of its body mass. Experiment A and C both lost 57.1% and 54.4% of their body masses respectively, see figure 5 for the weight loss comparisons. See appendix for more comparisons.

Weight Loss Per Week

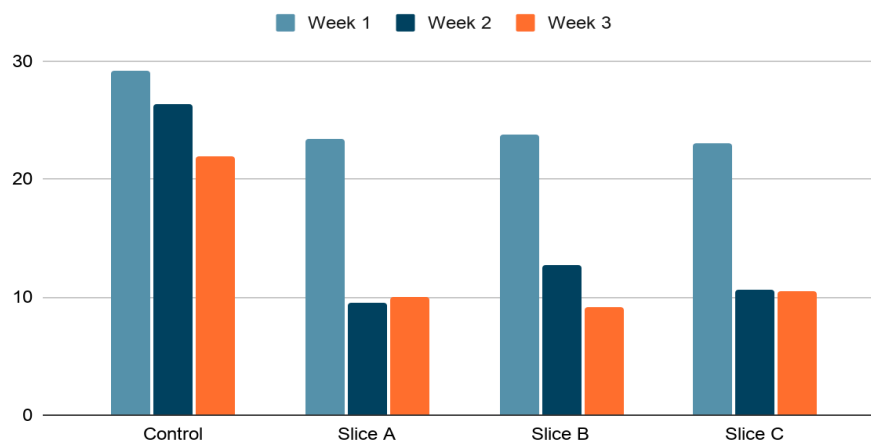


Fig. 5 Weight loss of each tomato slice per week measured in grams

The amount of mold on experiments B and C compared to the control slice were very unexpected. Since there was no moisture it was expected that the control slice would have developed more mold compared to those in the salt, in fact what happened was that the control slice developed almost no mold on the outside of the slice while the other two were almost completely covered in different typed of mold. It could have produced from the juices remaining in the salt and not being completely absorbed, meaning that the mold could thrive right next to the tomato. The salt that the tomatoes were in was also very difficult to fully

remove from experiment B and C since they were attached and embedded into the mold after it had grown to cover the entirety of the tomatoes (see fig. 7). This is reflective of what could happen to mummies if they were not stored in special conditions since they are very susceptible to damage, especially by insects and microorganisms (Abdel-Maksoud, Al-Shazly, El-Amin, 2011). Since the tomatoes were not placed in the necessary conditions to preserve mummies, the mold was able to grow and destroy the tomato.

As the Egyptians had used salts that were composed of sodium ions, carbonate, hydrogen carbonate, chloride, and sulphate (Kaup *et al.*, 2002) the results were much different than what had occurred with the tomato. The salts that were used in this experiment were composed of sodium and chloride in the table salt, oxygen, magnesium, and sulfur for the epsom salt, and carbon, oxygen, sodium, and hydrogen in the bicarbonate of soda. which unless all mixed together would not produce the desired effects that an Egyptian mummification



Fig. 6 Salt imbedded into mold of experiment C

would have. If this experiment had been done by mixing the salts together in order to combine more of the compounds found in natron the tomatoes would have more likely produced the intended effect and the results would have had more mummification progression. Certain mummification salts were also tested for their contents of borate and there showed to be a correlation between the borate and alkaline phosphate activity (Kaup *et al.*, 2002). The borate in the salt would have led to a more efficient purification of the enzymes of the body and would have inhibited the enzyme activity since it would have altered the overall protein structure; the borate would also have preserved the alkaline phosphate activity which explains the link between the levels of borate and alkaline phosphate in the mummified remains (Kaup *et al.*, 2002).

Most other experiments regarding mummification, especially those using parts of the human or animal anatomy, ensure to monitor not just the weight, but also the temperature, air-humidity, and pH-value, as well as taking molecular, histological, and bacteriological analysis (Öhrström *et al.*, 2020). These tests can improve the experiment since it allows the researcher to monitor every condition of the part of the body to ensure that the experiment runs smoothly. It also allows for analysis of the lengths of time it takes for the mummification to have effects on each area that they are analyzing.

Conclusion

Throughout this experiment the main purpose was to evaluate which types of salt would be best for dehydrating or mummifying different fruits or food products. Through the results it is clear that the table salt had the best dehydration effects, while epsom salt and bicarbonate of soda were less effective and produced areas where mold was able to thrive. If the salts had been mixed together, the results would have been different and may have resulted in the tomato being fully dehydrated. With the proper conditions that would have reflected Egyptian mummifications, such as the humidity or proper storage, mummification may have also turned out more similar. This laboratory did produce data surrounding which chemical compounds are necessary for a proper mummification and give more explanation surrounding why the Egyptians used a specific type of salt for their mummifications.

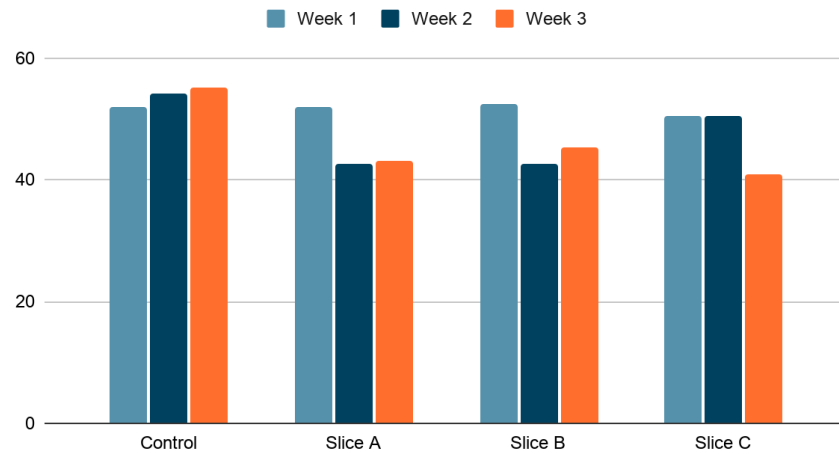
Reference List

- Abdel-Maksoud, G., Abed al-Sameh Al-Shazly, E. E., & El-Amin, A.-R. (2011). Damage caused by insects during the mummification process: an experimental study. *Archaeological and Anthropological Sciences*, 3(3), 291–308. <https://link.springer.com/article/10.1007/s12520-011-0069-9>
- Kaup, Y., Schmid, M., Middleton, A., & Weser, U. (2003). Borate in mummification salts and bones from Pharaonic Egypt. *Journal of Inorganic Biochemistry*, 94(3), 214–220. <https://www.sciencedirect.com/science/article/pii/S0162013403000023?via%3Dihub>
- Öhrström, L., Tekin, A., Biedermann, P., Morozova, I., Habicht, M., Gascho, D., Bode-Lesniewska, B., Imhof, A., Rühli, F., & Eppenberger, P. (2020). Experimental mummification—In the tracks of the ancient Egyptians. *Clinical Anatomy (New York, N. Y.)*, 33(6), 860–871. <https://onlinelibrary.wiley.com/doi/10.1002/ca.23568>

Appendix

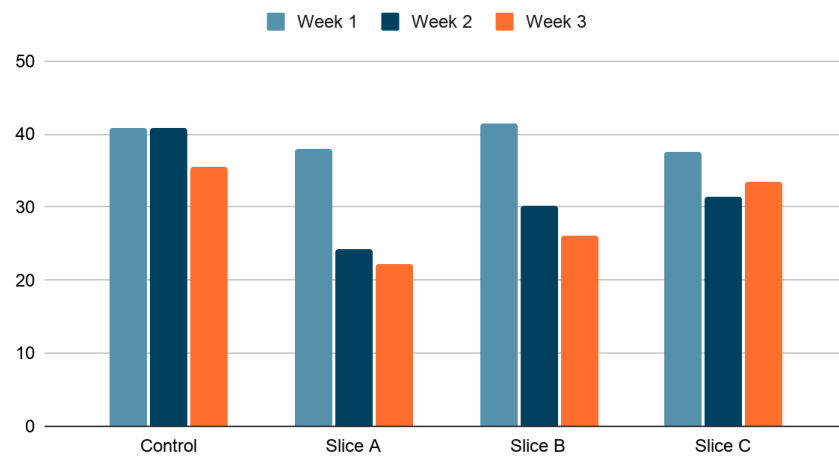
Charts and images

Length Differentiations



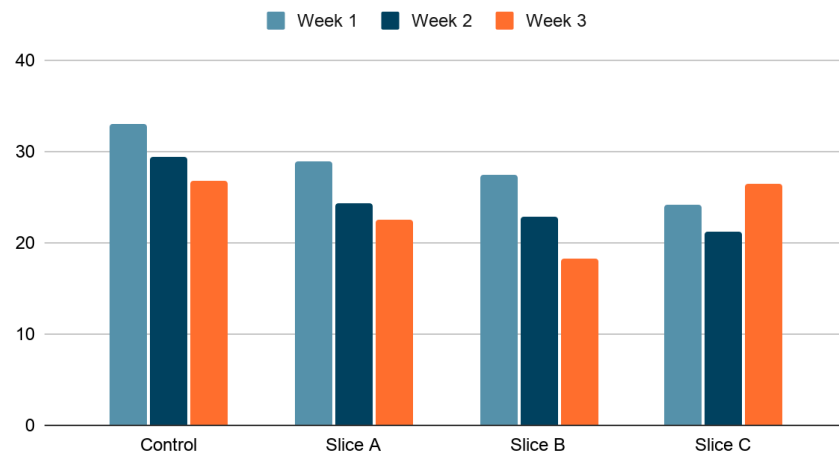
Note: This chart shows the length comparisons, measured in millimeters, of each slice from week 1 to week 3. It shows the added length of the control slice and slice B from week 2 to week 3.

Width Differentiations



Note: This chart shows the width comparisons, measured in millimeters, of each slice from week 1 to week 3. It shows the width increase of slice C from week 2 to week three.

Breadth Differentiations



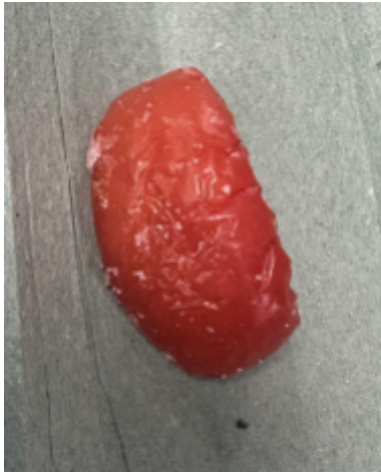
Note: This chart shows the comparisons of the breadth of each slice from week 1 to week 3, measured in millimeters. It shows the increase in breadth of slice C in week 2, which had increased from the initial breadth in week 1.



Note: The control slice during week two of the laboratory. There is only one spot of white mold present.



Note: The skin of the control slice during week 2.



Note: This is the skin of slice A during week 2 of the experiment.



Note: Slice A during week 2. Very dehydrated from the table salt.



Note: This is an image of slice C during week 2. It has begun to show spots of black mold and most of the juices were absorbed by the salt.



Note: Control slice in week 3. Mold spot is not apparent anymore and tomato had collapsed on itself.



Note: Skin of control slice during week 3. Shows signs of separation between skin and tomato insides.



Note: Slice A during week 3. Still dehydrated and seeds are not apparent anymore.



Note: Skin of slice A during week 3. Moderately wrinkled and most of the colour remained.



Note: Skin of slice B during week 3. Very wrinkled and very vibrant colour still. Shows signs of curling in on itself.



Note: Skin of slice C during week 3. A lot of wrinkles present and the colour has dulled significantly compared to the other slices.